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Medical Officers of Schools Association.

“SCHOOL OPHTHALMIA.”

A PAPER READ BEFORE THE ASSOCIATION

On February 25th, 1897.

BY

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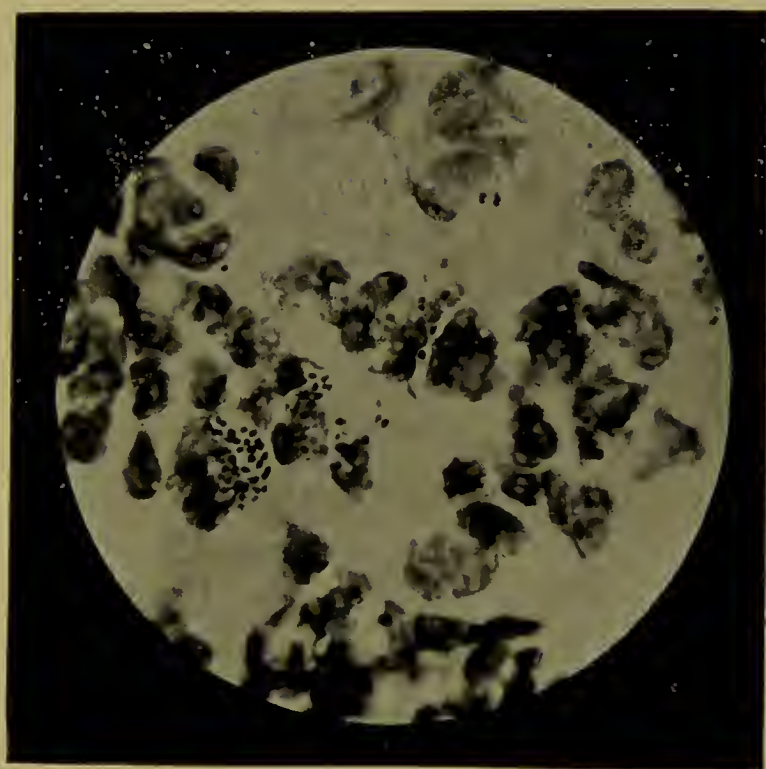
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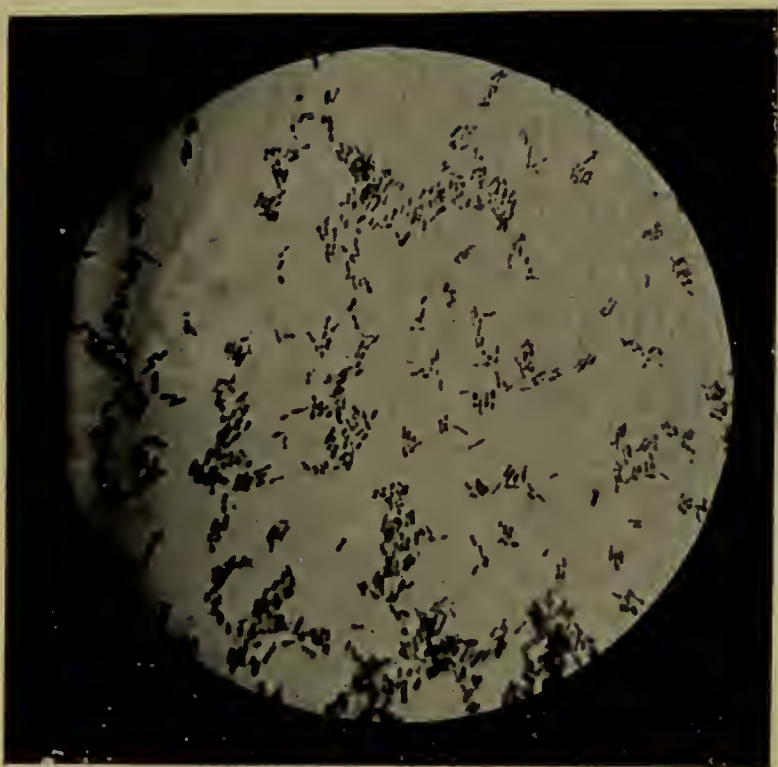
1. GONOCOCCI OF PURULENT OPHTHALMIA. (COVER-
GLASS PREPARATION.) $\times 1,000$.
2. DIPHTHERIA BACILLI FROM CULTIVATION ON
SERUM. $\times 1,000$.
3. WEEK'S BACILLI. $\times 1,000$.
4. TRACHOMACOCCHI FROM CULTIVATION ON SERUM.
 $\times 1,000$.
5. PNEUMOCOCCI. $\times 1,000$.
6. ZEROSIS BACILLI. $\times 1,000$.



1.

GONOCOCCI $\times 1000$.

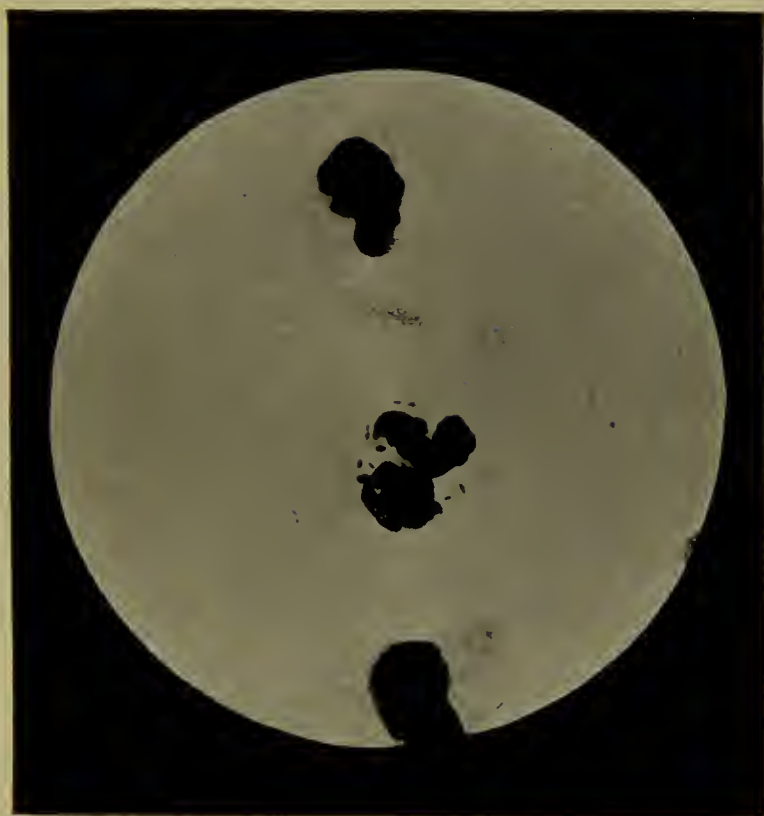
From a case of purulent ophthalmia: 13th day of disease. Cover-glass preparation made from discharge from eye. (*Case K.P.*)



2.

BACILLUS DIPHTHERIÆ $\times 1000$.

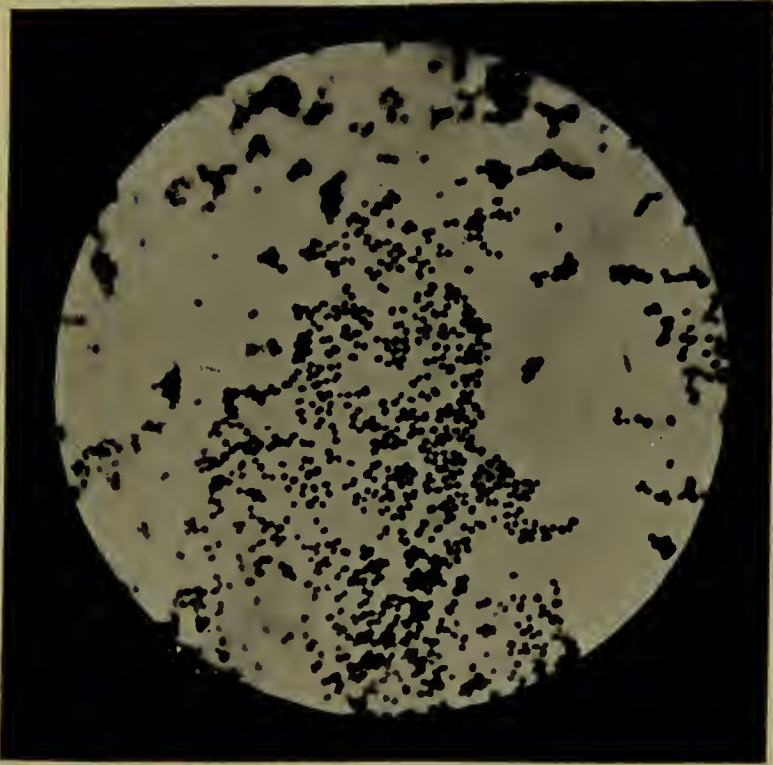
Cover-glass preparation from culture on blood-serum inoculated from diseased conjunctiva.



3.

WEEK'S BACILLI $\times 1000$.

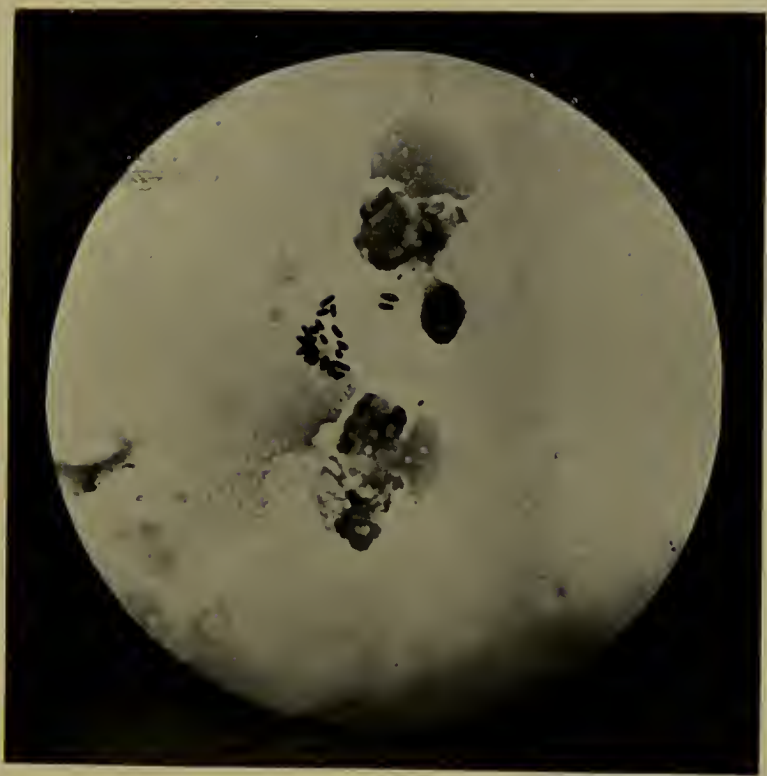
Cover-glass preparation from discharge from a conjunctiva with acute mucopurulent ophthalmia: 1st day of disease. (*Case H.T.*)



4.

TRACHOMACOCCHI $\times 1000$.

Obtained from a cultivation upon blood-serum, which had been inoculated from material squeezed from a conjunctiva with trachoma. Stained by Gram's method.



5.

PNEUMOCOCCI (?) $\times 1000$.

A cover-glass preparation from discharge from inflamed eye. (*Case J.R.*)



6.

ZEROSIS BACILLI $\times 1000$.

A cover-glass impression made from conjunctiva with epithelial zerosis.
Stained by Gram's method. (*Case F.D.*)

SCHOOL OPHTHALMIA.

At first sight it may seem somewhat strange to apologise for the title of this paper, chosen, as it was, by myself. For all that, the phrase "school ophthalmia" is a misnomer, inasmuch as it implies a peculiar form of eye disease found in schools and nowhere else. In seeking to define its meaning, Members of this Association need scarcely be reminded that there is no malady of the sort which we do not find without as well as within the walls of such institutions. Nevertheless the phrase has a distinct advantage, because we learn from it that certain forms of ophthalmia are common in schools, just as they are in other places where folk come together in numbers, as workhouses, ships, hospitals, and barracks. Although open to objection, then, the title will suit our present purpose, which is to discuss the varieties and the bearings of epidemic conjunctivitis amongst young people brought together for educational or other reasons.

To a medical audience it is needless to insist upon the significance of any conjunctival inflammation that is capable of spreading contagion from the sick to the healthy. Some of those here this afternoon have had a wide experience of such disorders, and there is probably nobody in the room who has not at one time or another been called upon to deal with them. The direct and indirect mischief brought about by these ailments is indeed great. For example, the reputation of a good-class school is bound to suffer from an outbreak of ophthalmia among its scholars, while the work and the discipline of the latter

must needs be dislocated. In the poorer schools, particularly the parochial, the effects are even more serious. There large sums of money may have to be expended before the pest can be stamped out; the education of affected children may be brought to a standstill for many months together; sight may be damaged; and, last but not least, the victims of the epidemic may be handicapped by the disease for years after they have passed into the outside world. Their economic value is in this way reduced, while there is the ever-present risk that they may communicate their malady to those about them. The question of ophthalmia and its prevention in parochial schools, therefore, involves interests of the widest possible kind. So important, indeed, is the matter now deemed by the Local Government Board that they have directed an inquiry into the state as regards ophthalmia of every Poor Law child in London, as a first step towards some plan for rooting out the evil.

So far I have spoken of "ophthalmia" in a broad and general sense as meaning any inflammation of the conjunctiva. In the present paper I propose dealing with acute affections of that membrane only, as being most likely to fall under the notice of Members of this Association. From a practical point of view it is necessary to distinguish carefully between the various specific ailments, at least three in number, included under acute ophthalmia. Some of these affections are of little moment, whereas others are exactly the reverse. But they are all distinguished by one feature—namely, the power of becoming epidemic under certain conditions of which we cannot as yet speak with scientific exactitude. For convenience of description, they may be classified as follows:—

- (1) Purulent Ophthalmia.
- (2) Muco-purulent Ophthalmia.
- (3) Acute Trachoma.

A brief account may next be given of the leading features of each of these three forms of acute inflammation of the conjunctiva.

(1) *Purulent Ophthalmia*.—This formidable ailment was once common enough in the large schools of this country. For instance, Sir Patrick MacGregor¹ has given a graphic account of an outbreak that occurred in the early part of this century at the Chelsea Military Asylum, where 1,140 children were lodged. In November, 1809, about 240 patients were under treatment, and we are told that the epidemic resisted all remedial measures until six months later, when the whole of the children suffering from ophthalmia were removed to a detached hospital at some distance. From that time the disorder gradually decreased, so that a few months later five cases only remained under treatment. Christ's Hospital, again, suffered severely about the same time, and an interesting account of the facts has been given by Lloyd,² the then surgeon to the school. Sir Thomas Watson, in his classical "Lectures," speaks of Purulent Ophthalmia having broken out in a large school in Yorkshire, with the result that blindness of one or both eyes, or other serious consequences, followed in nearly twenty cases. One of the best recorded outbreaks of comparatively recent times was that at the Hanwell School in 1862. The late Sir William Bowman, who was called in by the managing body of the institution, divided the cases into four groups of varying intensity, and spoke of there being 300 children with the worst type, *i.e.*, with Purulent Ophthalmia. He found that several of the younger lads had lost one or both eyes.

Of late little has been heard of purulent ophthalmia either in Parochial or in Private Schools, so that it may be asserted with almost absolute certainty that it is now as rare under the Poor Law as elsewhere. There is little, however, to prevent it from again becoming epidemic in some of these institutions if rigid precautions be not enforced to keep it from gaining an entry.

Purulent Ophthalmia is always due to infection of the conjunctiva by a particular micro-organism, the gonococcus, which may be demonstrated with the microscope both in the discharges from the eye and also in excised fragments

¹ ² For list of References, see page 23, *post*.

of mucous membrane. Its signs and symptoms are of such a nature that they cannot be overlooked. The disease makes its appearance, as a rule, within three days after the eye has been infected. Stiffness of the lids and pain, photophobia and lacrymation, are constantly present, and bear a direct relationship to the intensity of the virus. The lids are glossy, red, and shining, and in marked cases so much swollen that the patient is altogether unable to open his eye. The discharge, at first thin and whey-like, when fully established may run from the eye in great quantity; it has an alkaline reaction, and exactly resembles pus, such as that of an ordinary abscess. The palpebral conjunctiva, when it can be exposed for examination, is found to be swollen, rough, of crimson-lake hue, and arranged in folds that spring forward as soon as the lids are everted. The inner surface of the upper lid is not infrequently shaggy enough to recall the pile of red velvet, while the retro-tarsal folds are laden with pus. Slight hæmorrhages from the conjunctiva readily occur, even when the parts are handled with the utmost gentleness. The ocular conjunctiva is often greatly swollen, so that it may overlap the cornea on every side or even protrude from between the tumified lids, and appear upon the cheek as a reddish, semi-transparent mass. The cornea suffers in certainly one-third of the cases, the commonest condition being one of marginal ulceration, which comes on early, spreads rapidly, and perhaps leads to perforation of the membrane and loss of the eye. These corneal lesions are thought to be due to direct invasion by the specific organisms, which gain admission to the *stroma* through a spot from which the protecting epithelial investment has been detached. However this may be, I have more than once succeeded in cultivating ordinary pyococci from scrapings taken from the ulcers. Then, the swollen lids and conjunctiva have something to do with the result, possibly by mechanically interfering with the nutrition of the cornea. My own experience teaches me that corneal complications are likely to occur in proportion to the amount of chemosis,

although that observation, perhaps, means that both swelling of the conjunctiva and corneal ulceration stand in relation to the number and potency of the specific organisms. Lastly, the preauricular glands are enlarged and tender; and synovitis of the larger joints has been met with.

It will be perceived from this slight sketch that Purulent Ophthalmia is a serious complaint, exceedingly dangerous as regards sight. While this is undoubtedly the case, one must be prepared to recognise the fact that great individual differences are met with. In newly-born children, for instance, the stress falls upon the palpebral conjunctiva, and injuries to sight are relatively rare, especially when the case is treated early; in older subjects, on the other hand, chemosis is great, pain is a prominent feature, and the cornea suffers in perhaps one half of those affected. Between individuals of much the same age, somewhat similar differences are to be observed, and these must be explained in one of two ways, namely, (1) by variations in the virulence of the disease-germs, or (2) by idiosyncrasy on the part of the patient.

A marked case of Purulent Ophthalmia cannot be mistaken, but one of milder type might be confounded with muco-purulent conjunctivitis of unusual severity, although it would nevertheless be capable of communicating to a second person a form of ophthalmia that might end in loss of sight. Fortunately there is an unfailing test as to the nature of the disease, viz., the bacteriological one. This is so simple that there can be no excuse for neglecting it. A clean cover-glass (No. 1) is smeared with a little pus taken from the conjunctival sac, and, after allowing the preparation to dry, it is passed two or three times over a spirit flame or Bunsen lamp. If the specimen appears unduly thick it may be floated for a few minutes in a strong (15 per cent.) solution of acetic acid, which is afterwards to be carefully washed away by means of distilled water. The next step is to pour a few drops of almost any aniline basic dye over the cover-glass, and, after waiting five minutes, to wash the specimen once more with distilled water.

The stain that, in my experience, gives the best all round result is Löffler's alkaline methylene blue,* but Kühne's carbolic methyl blue,* or methyl or gentian violet (1 per cent.) answer admirably. The last step is to dry the preparation, and to mount it in xylol-balsam. Examination with a $\frac{1}{12}$ inch oil immersion lens and Abbé condenser will show that the germs of Purulent Ophthalmia are usually arranged in pairs—that is to say, in diplococcus form. They lie singly or in groups either free in the discharge, or (much more commonly) within the protoplasm of the polynucleated leucocytes that go to make up the mass of the specimen; the latter arrangement must be regarded as characteristic. If any doubt be still entertained as to the exact nature of the organisms, recourse may be had to Gram's method,* with or without counter-staining by means of eosine. It would lie beyond my present purpose to describe the details of this well-known differential process; I will merely say that, while ordinary pus cocci retain the gentian violet when thus treated, gonococci become decolorised. A glance at the preparations shown this afternoon will do more than pages of mere verbal description to render the subject intelligible.

It is impossible to leave the question without saying something with regard to negative bacteriological results. It is obvious that gonococci may not be found with the microscope, and yet the case may be one of Purulent Ophthalmia. This failure may be explained in several ways. Thus, the organisms are likely to be so scanty at an early stage of disease that their existence may be overlooked, a thing easy enough to do, as will be acknowledged by everybody who has worked with high powers of the microscope. Again, the preparation may have been overheated, when bacilli are apt to stain with difficulty or not at all; or, lastly, there may be some other fault in the method of investigation. We may conclude, therefore, that the discovery of gonococci justifies the diagnosis of Purulent Ophthalmia, apart from other signs

* See Appendix, page 21, *post*.

and symptoms that may be presented by the case. On the other hand, a failure to find those organisms cannot be accepted as excluding the existence of the disease. In order to avoid error, it is advisable to make repeated examinations of the discharge, until the presence or absence of specific germs is rendered reasonably certain. To sum up : if the discharge from an eye with acute conjunctivitis be found to contain diplococci in the protoplasm of the leucocytes, and if those organisms stain with the ordinary aniline dyes and are decolorised by Gram's method, the surgeon need feel no hesitation in making a diagnosis of Purulent Ophthalmia. Otherwise, I should recommend him not to commit himself to a definite opinion one way or the other.

(2) *Acute Muco-purulent Ophthalmia*.—Acute catarrhal ophthalmia, or muco-purulent conjunctivitis, is one of the commonest eye diseases met with in this country. Its contagiousness and epidemic tendency endow it with considerable practical importance, especially to those in charge of schools. Its symptoms, no less than its treatment, are known to every practitioner of medicine, but there are nevertheless, points in both that will repay further study. In good-class English schools it would seem that outbreaks of ophthalmia practically always belong to this type of disease, although we may hope for expressions of opinion from Members of the Association upon this point. The ailment is certainly far from uncommon in Poor Law schools, even when the latter happen to be of good construction and under excellent management, both lay and medical. The malady does little harm, but its signs now and then appear most formidable, especially to one not accustomed to the affection. It seldom damages sight, at least in young persons, and never leaves any troublesome sequels behind, except in the presence of a super-added contagion, as for instance, that of trachoma.

This disease must be regarded as due to a specific micro-organism. This fact was first pointed out by Koch,³ who, during a visit to Egypt in 1883, examined bacterio-

³ For list of References, see page 23, *post*

logically some fifty cases of the ophthalmia that prevails epidemically in that country. He found two microbes in the eye discharges—the one associated with severe, and the other with mild, symptoms of the disease. The former appeared to be identical with Neisser's gonococcus, while the latter he described as a very small bacillus. In 1886 John E. Weeks, of New York, published a careful memoir⁴ upon the subject. He claimed that small, well-defined bacilli were always present in the secretion of catarrhal ophthalmia, and he succeeded in setting up the disease when the specific pus was implanted on the human conjunctiva. He failed to obtain a pure culture of the organism, as he found a small, club-shaped bacillus in all his preparations. In six instances inoculation with the mixed growth gave rise to acute inflammation of the conjunctiva: the clubbed bacillus was proved to possess no pathogenic properties. In the following year Kartulis⁵ described the same organism in cases of Egyptian Ophthalmia. Out of six inoculations of the human eye that observer set up the disease twice.

Morax⁶ (1894) concluded from his investigations that the small bacillus was constantly present in this form of ophthalmia. Although inoculation of a pure culture failed to produce any appreciable result in animals, yet it succeeded upon his own eye. Somewhat later Mr. H. E. Juler⁷ mentioned the fact that he had come across the same organism in many, but not in all, cases of catarrhal ophthalmia.

Weeks⁸ has lately (1895) reviewed the state of our knowledge concerning this microbe. From the examination of between one and two thousand cases of acute contagious conjunctivitis, he is enabled to affirm that the bacillus in question is constantly to be found in the secretion. During last year Morax and Beach⁹ published a full account of their experiments with this micro-organism, which they managed to cultivate upon agar-agar, with or without the addition of human blood serum. These authors express the definite opinion that acute catarrhal ophthalmia

⁴ ⁵ ⁶ ⁷ ⁸ ⁹ For list of Reference, see page 23, *post*.

“invariably coincides with the presence of a small specific bacillus.”

For some years past I have made a point of examining bacteriologically the secretion from all doubtful cases of catarrhal ophthalmia that have fallen under my notice, and can fully confirm the observations of Weeks, Morax, and Beach. As stated in a work¹⁰ published in 1895, I am persuaded in my own mind that the presence of certain slender bacilli may be taken as diagnostic of this form of conjunctivitis, and, further, that the number of organisms present is directly proportionate to the severity of the case. Additional experience has strengthened the views then expressed, so that I have come to regard a microscopic examination of the discharge from any inflamed conjunctiva as essential to a satisfactory and scientific diagnosis.

Cover-glass preparations are to be made from the stringy secretion present in the conjunctival sinuses, and stained exactly as described when speaking of Purulent Ophthalmia. If the case be one of catarrhal ophthalmia, the specimen will be found to contain many polynucleated leucocytes, often in a condition of mucous degeneration, and a varying number of epithelial cells, in addition to the pathogenic microbes. The latter are short bacilli, varying in length from $.75\mu$ to 1.5μ . They resemble rather closely the bacilli of mouse septicæmia, but are smaller, and have rounded instead of angular ends; they occasionally form short chains by juxtaposition. They show a special tendency to become grouped in the protoplasm of the pus cells, which in some preparations are literally loaded with them. Here and there the bacilli may be noticed to cling, as it were, to certain of the epithelial elements, or they may be seen lying free. They nearly always stain evenly: in the fresh organism I have never observed any signs of segmentation or of sporulation. It is diagnostically important to note that they become decolorised by Gram's method, so that in preparations treated by that process one often enough fails to find a single microbe answering to their description.

¹⁰ For list of References, see page 23, *post*.

In severe catarrhal ophthalmia the short bacilli occur in great numbers after the lapse of the first day; I have seen cases of this sort where scarcely a leucocyte in the specimen was free from one or more organisms. In mild types of disease, on the other hand, they may be so scanty that a careful search has to be made to find a single one. Here, as elsewhere, negative results possess merely a negative value, and do not exclude the existence of a slight or commencing catarrhal ophthalmia. The pathogenic organisms become progressively fewer and fewer with subsidence of the disease, but, in my experience, persist to some extent so long as discharge is given off by the conjunctiva.

There are two types of acute conjunctivitis in which I have found the short bacillus:—

(a) Classical catarrhal ophthalmia, the leading features of which are great and rapid infectivity, profuse yellowish-white discharge, more or less œdema of the lids, and a bloodshot eyeball, with or without hæmorrhagic patches. The bacilli appear to be constantly present in this, the commonest, type of disease.

(b) A variety in which follicular enlargement is superadded to the signs of acute or sub-acute inflammation. The small growths that mark the condition occur chiefly upon the lower lids, are round or oval, disposed in one or more rows, and better marked towards the outer canthus. The upper lids, as a rule, show little change, being merely congested or slightly roughened by tiny elevations. The outbreak recently recorded by Mr. Simeon Snell¹¹ as having occurred in a good-class school at York was almost certainly of this kind. So far as my experience goes, it is the most common type of acute ophthalmia met with in well-managed schools of the upper and middle class. Its main interest to us this afternoon lies in the likelihood of its being mistaken for the far more serious condition, Trachoma, to which we may next turn.

(3) *Acute Trachoma*.—This formidable affection, so far as I know, is nowadays met with only in crowded Poor

¹¹ For list of References, see page 23, *post*.

Law schools and other places of that kind, but even there it is by no means common. It is distinguished by its powers of rapid spread under bad sanitary conditions, as, for instance, overcrowding, imperfect ventilation, and neglect of isolation. Above all it is characterised by the fact that it always entails a chronic disease of the palpebral conjunctiva, which has received the singularly unfortunate name of "Granular Lids." Although there are many points about this affection that still remain obscure, we may, I think, take it as certain that it arises in one way, and in one only, namely, by contagion. As to its specific *contagium*, there is considerable conflict of opinion. Many organisms have been described, but it cannot yet be asserted with certainty which of them is the cause of the disease. For my own part, I have some reason for believing that the diplococci shown under the microscope this afternoon may be the causal agents. At all events these organisms may generally be demonstrated in sections cut from diseased conjunctiva; they may, furthermore, be obtained, although not in every instance, by inoculating tubes of blood-serum with material squeezed from the mucous membrane of an eye affected with chronic Trachoma. They range from 0.6μ to 1.0μ in diameter, stain with methylene blue, &c., &c., and do not lose their colour when the preparation is treated by Gram's method. Whether they be the actual cause or not, there can be no reasonable doubt that Trachoma is due to some kind of micro-organism.

The symptoms of Acute Trachoma present a wide diversity. The affection, as a rule, is bilateral, but it is quite common for one eye to be attacked 3 to 10 days before the other, in which case the first generally suffers more than the second. This may probably be explained on the assumption that the virus has undergone some alteration before passing from one eye to the other.

In severe instances inflammatory symptoms are so marked as almost to suggest that one is dealing with Purulent Ophthalmia. There are two points, however, the one negative and the other positive, by which Acute

Trachoma may be recognised: first, the absence of the gonococcus in the discharge from the eye; secondly, the state of the palpebral conjunctiva, which presents many deeply congested ridges and depressions, over which are scattered numerous opaque, reddish-grey trachoma grains or bodies. Ulcerations of the cornea are now and then met with, but it is to be noted that extensive lesions, such as are common in Purulent Ophthalmia, are the exception in Acute Trachoma. The preauricular glands are nearly always swollen and tender.

The violent inflammatory symptoms soon subside. The discharge grows smaller and smaller, and at the same time changes its character from a pus-like fluid to one that is more or less gleeety. Within a month or so from the beginning of the attack external signs will have disappeared, except a slight dropping of the upper lids, and what is commonly described as a "weak" look about the eyes. On everting the lids, however, the conjunctiva will be found extensively diseased. It will be markedly reddened and thickened, fold upon fold springing into prominence when the lower lid is pulled down. It will be studded by numerous "sago-grains," which bleed rapidly, and often by red, punctate spots upon the tarsal conjunctiva of the upper lid. The superior cul-de-sac will be filled with semi-transparent folds of infiltrated membrane that can usually be brought into view by directing the patient to look down while his upper lid is raised by the surgeon's finger. This is the condition known nowadays as Trachoma, a disease that in its chronic form has proved the bane and curse of certain Poor Law schools, where it has remained endemic for years.

We have next to enquire whether epidemic forms of ophthalmia are ever associated with microbes other than the three already mentioned. This question must now be answered in the affirmative. Axenfeld* in 1896 described

*For the sake of historical accuracy it should be noted that Morax (*Thèse de Paris*, 1894, p. 88) was the first to draw attention to cases of acute conjunctivitis due to pneumococci. He reported four mild instances in children under three years of age. Parinaud and Gasparini, too, have recorded examples. Axenfeld, however, was the first to describe anything approaching an outbreak of this pneumococcus-ophthalmia.

an outbreak ¹² of acute ophthalmia that had affected twenty-five out of the ninety-four inmates of a school. Pus from the eyes was found in every instance to contain the pneumococcus—an organism, it need scarcely be remarked, now acknowledged to be the commonest cause of croupous pneumonia and of some of its complications, as pleurisy and pericarditis. The affection, in Axenfeld's experience, was nearly always bilateral, and the inflammation completely subsided within eight days. He succeeded in cultivating the organism, but failed to set up any reaction by applying a pure culture to his own eye. Axenfeld maintains the propriety of distinguishing a pneumococcus-ophthalmia, since in all his cases the same clinical appearances coincided with the same organism. Gifford,¹³ in an excellent paper, has since then gone fully into the question. He has been able to examine some forty cases—samples, so to speak, of several distinct outbreaks that have taken place during the last eight years in Omaha and the district. The pneumococcus was found in all save four patients, while its causal relation was proved by inoculating the human conjunctiva with pure cultures. The ophthalmia itself presented no appearances sufficiently distinctive to allow one to separate it off-hand from ordinary catarrhal ophthalmia, unless it were the frequent existence upon the conjunctiva of a thin pellicle of fibrin that could be easily wiped away. Gifford noted cases in adults as well as in children.

Speaking for myself, I am familiar with sporadic cases of mild inflammation of the conjunctiva in the discharge from which pneumococci may be found. The disease is generally bilateral, and, so far, I have observed it only in children, although I should not be inclined to lay much stress upon the latter fact, as I see many more children than adults. The symptoms are generally mild, but now and then slight chemosis and a few sub-conjunctival hæmorrhages are present, together with a fair amount of muco-purulent discharge. The palpebral conjunctiva is covered by a delicate greyish film of coagulated secretion, usually making its

¹² ¹³ For list of References, see page 23, *post*.

appearance from one to six days after the first sign of inflammation has been noticed. Corneal complications are extremely rare, and the ailment, as a rule, is soon over.

There yet remains one other form. Within the last few months Gelpke¹⁴ has had an opportunity of investigating a wide-spread inflammation of the eyes that prevailed as an epidemic in two small villages near Carlsruhe. It affected school children in the first instance, and later grown-up people. It commenced with feverishness, lassitude, and headache—a group of symptoms speedily followed by photophobia, swelling of the lids, and an abundant secretion of pus from the eyes. The œdematous palpebral conjunctiva was folded, follicular, of purple hue, and flecked over with many small hæmorrhages; the bulbar conjunctiva was chemotic. It is not surprising that this severe malady often entailed corneal complications. Gelpke succeeded in cultivating an organism from the conjunctival secretion. This he described as a bacillus, with pointed ends, averaging 1μ in length. It could be stained by the usual dyes, and also by Gram's method. It contained highly refracting spores, and presented the unusual feature of being divided into two parts by a lighter zone. This microbe appears to resemble in certain respects the so-called Zerosis bacillus or spirillum, which is associated with some forms of night-blindness. Gelpke, however, believes the two to be different, and proposes to name the one described by him *B. Septatus*.

A few words of recapitulation. Outbreaks of acute ophthalmia* may be associated with the following disease-germs:—

- (1) Gonococci.
- (2) Week's bacilli.
- (3) Pneumococci.
- (4) Trachomacocci.
- (5) Bacillus Septatus.

¹⁴ For list of References, see page 23, *post*.

* The foregoing list includes only such microbes as are known to be present in the various forms of epidemic ophthalmia. The conjunctiva, however, may re-act to some other organisms, particularly the Klebs-Löffler bacilli, Staphylococci and Streptococci Pyogenes.

The evidence is conclusive in respect of the two micro-parasites named first; fairly convincing as regards the pneumococcus; while as to the others, the chain of proof cannot yet be regarded as altogether complete. It may fall to the lot of some Member of *The Medical Officers of Schools Association* to supplement and perfect our knowledge of the latter microbes.

I would urge that the forms of acute ophthalmia described in the foregoing pages differ not so much in degree as in kind. They are, in my opinion, specific ailments, due to distinct and separate causes. If this fact be not fully recognised and acted upon, the risks of multiple infection will be ever-present. To mix in one sleeping ward Muco-purulent Ophthalmia and Acute Trachoma would be to commit a blunder of no small magnitude. The lesson to be drawn from the increased etiological knowledge now at our disposal is to sort out our eye cases with the same care that would be observed in dealing with such different disorders as diphtheria, small-pox, scarlet fever, and measles. In truth, a detailed classification of the acute ophthalmiæ would seem to form a first step towards their rational treatment.

The term "ophthalmia" lies open to several objections. It is vague and elastic, and connotes many different things. Then, there is the odium that attaches to the name in the public mind, so that on this account alone the medical officers of important schools may well shrink from printing their experiences, no matter how valuable. Yet it is almost impossible to over estimate the usefulness of such records, especially when attention has been paid to diagnosis and to cause. Indeed, the time appears to be now ripe for replacing the old designations with others more in keeping with the state of present knowledge. Thus, we might altogether drop the terms purulent, muco-purulent, &c., &c., &c., and speak of acute conjunctivitis as due to gonococci, to Week's bacilli, to pneumococci, and so forth. This plan would have the obvious advantage of ensuring uniformity in our descriptions of disease, and thereby allow exact

conclusions to be drawn from the published records of outbreaks.

Apart from questions of nomenclature, as practical surgeons we must, I think, admit that even in well-managed schools outbreaks of acute ophthalmia will now and then occur. When these epidemics belong to the Muco-purulent type they are really of no great moment, although often alarming enough to a casual observer. That disorder brings about no after-consequences, and if classification be rigorously carried out, can never lead to Trachoma. So far as we know, this form of conjunctivitis does not arise apart from contagion, but for all that it is often difficult, or impossible, to trace out the origin of first cases. It spreads rapidly, and may affect a host of children unless prompt steps be taken. It must be met by rigid isolation and other measures into which I have no present intention of entering. So much for the inflammation due to Week's bacillus, and possibly, also, to the pneumococcus. With regard to the forms of ophthalmia associated with gonococci and trachomacocci, however, the case is very different. Those disorders, as we have seen, give rise to grave immediate or remote results, and their recurrence in epidemic form must be regarded as so many evidences of bad management or lax medical administration.

In conclusion, let me insist upon the necessity of an accurate diagnosis of any form of epidemic ophthalmia. To do that with even tolerable certainty the surgeon must needs resort to bacteriology. The methods of investigation are not difficult: the making of cover-glass preparations generally suffices for the end in view, and cultivation tests are not essential, at all events in those types of acute ophthalmia that are likely to be commonly met with in schools.

APPENDIX.

THE following formulæ, although well-known to those engaged in bacteriological work, may possibly be useful to some who read this paper.

LÖFFLER'S METHYLENE BLUE :—

Saturated alcoholic solution of methylene blue, 30 parts.

Solution of caustic potash (1 to 10,000), 100 parts.

KÜHNE'S METHYLENE BLUE :—

Saturated alcoholic solution of methylene blue, 10 parts.

Carbolic lotion (5 %), 90 parts.

GRAM'S METHOD.—Smear a little pus over the surface of a No. 1 cover-glass. When dry, pass two or three times over a spirit flame. Shake together for a minute a mixture of aniline oil (1 part) and distilled water (25 parts), and filter the emulsion. Add a saturated alcoholic solution of gentian violet to the aniline water, until the latter becomes opaque-looking, and then filter through Swedish paper. Float cover-glass preparation in the filtered solution for two minutes, and then place it in Gram's solution (Iodine, 1 ; iodide of potassium, 2 ; distilled water, 50)* for about thirty seconds, or until the specimen becomes black. Next place cover-glass in absolute alcohol until no more stain comes away from it. Float for a few seconds only in a 0·25 % watery solution of eosine ; and, lastly, wash with distilled water, dry, and mount in Canada balsam and xylol. Gonococci and Week's bacilli are decolorised, but the trachomacoccus, the pneumococcus, and the zerosis bacilli retain the violet hue of the gentian violet used in the process.

* The *Liquor Iodi* of the Pharmacopœia, diluted with water to a light sherry tint. answers the purpose (Goodall & Washbourn).

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